2016 Energy Standards Residential Water Heating Requirements

Andrea Bailey
Appliances and Outreach and Education Office
Efficiency Division

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Goals of this Training

Review the Energy Standards requirements for residential water-heating systems

- All Occupancies
  - Mandatory requirements, features, and devices
- Newly Constructed Buildings
  - Mandatory
  - Prescriptive
- Existing Buildings - Additions and alterations
  - Prescriptive

Questions…

Please feel free to ask at anytime!

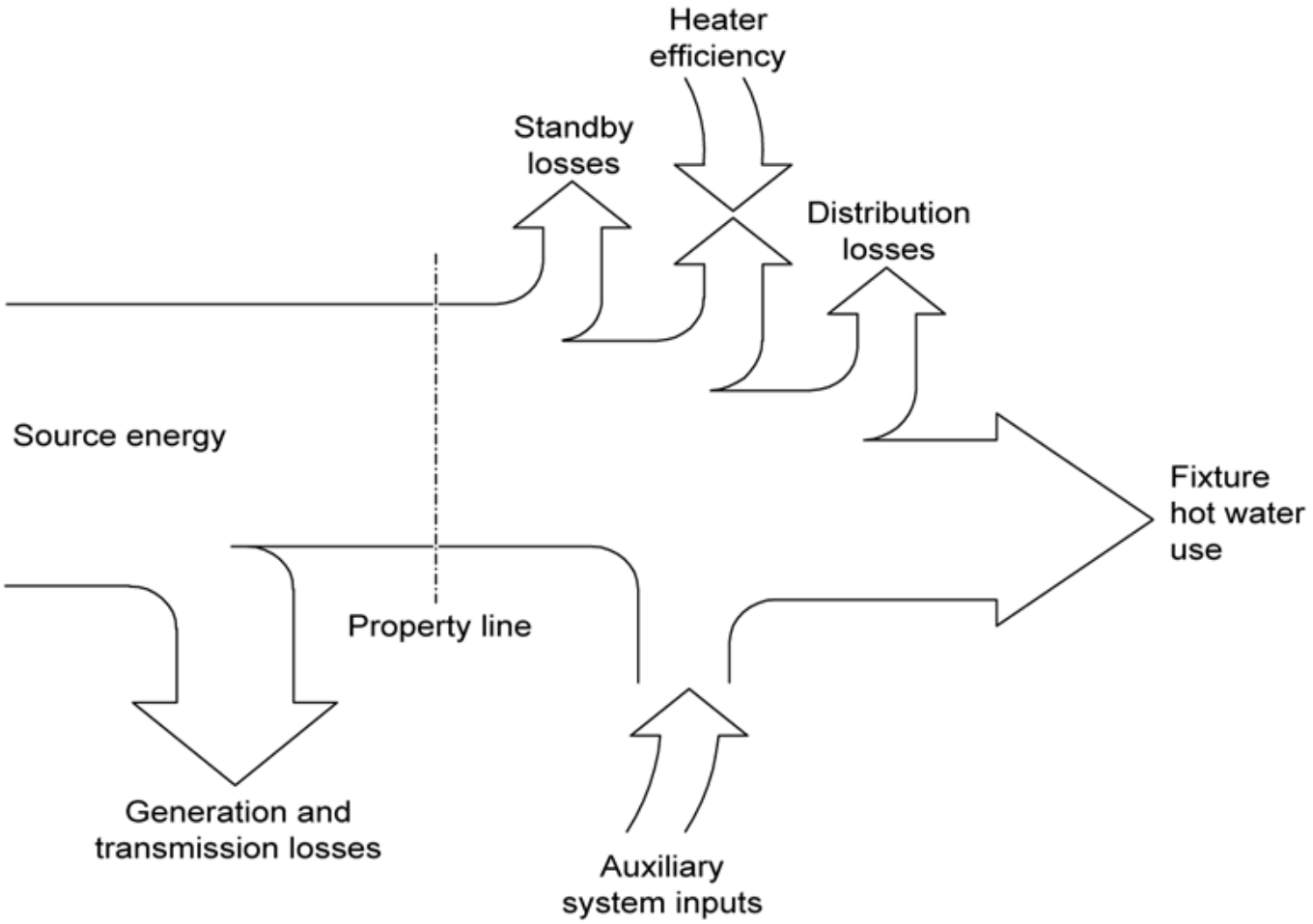
- During training
- At break
- Afterwards

- Your questions enhance the class

A Little Energy Commission History

- Warren Alquist Act created the Energy Commission in 1974 and gave it authority to develop and maintain Building Energy Efficiency Standards
- Requires the Energy Standards to be cost effective over the economic life of the structure
- Requires the Energy Commission to update the Energy Standards periodically (about every 3 years)

Why Do We Have Energy Standards for Water Heating?



Approaches

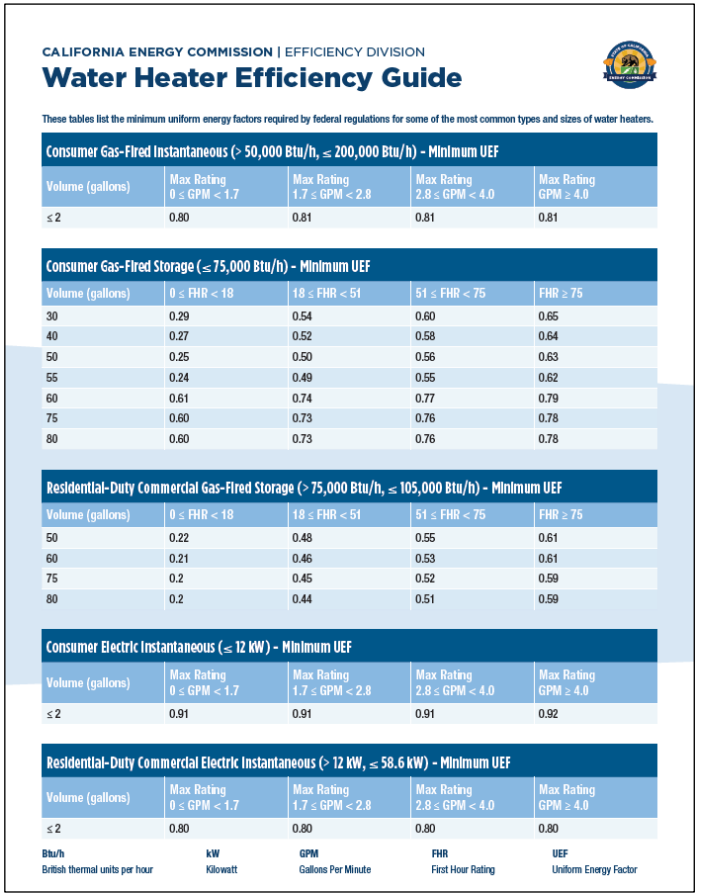
- **Mandatory** - measures that must be met regardless of which compliance approach is used
- **Prescriptive Compliance Approach** - direct pathway to compliance, is the standard design building
- **Performance Compliance Approach** - most detailed and flexible approach, more efficient features may be used to make up for less efficient features (tradeoffs), modeling software is used to show the proposed design uses no more energy than the standard design building

ALL OCCUPANCIES - MANDATORY REQUIREMENTS FOR THE MANUFACTURE, CONSTRUCTION AND INSTALLATION OF SYSTEMS, EQUIPMENT AND BUILDING COMPONENTS

SECTIONS 110.1 AND 110.3

§ 110.1 - Mandatory Requirements for Appliances

a) Regulated appliances may only be installed if the minimum efficiencies of Title 20 are met.



CALIFORNIA ENERGY COMMISSION | EFFICIENCY DIVISION

Water Heater Efficiency Guide

These tables list the minimum uniform energy factors required by federal regulations for some of the most common types and sizes of water heaters.

Consumer Gas-Fired Instantaneous (> 50,000 Btu/h, ≤ 200,000 Btu/h) - Minimum UEF

Volume (gallons)	Max Rating 0 ≤ GPM < 1.7	Max Rating 1.7 ≤ GPM < 2.8	Max Rating 2.8 ≤ GPM < 4.0	Max Rating GPM ≥ 4.0
≤ 2	0.80	0.81	0.81	0.81

Consumer Gas-Fired Storage (≤ 75,000 Btu/h) - Minimum UEF

Volume (gallons)	0 ≤ FHR < 18	18 ≤ FHR < 51	51 ≤ FHR < 75	FHR ≥ 75
30	0.29	0.54	0.60	0.65
40	0.27	0.52	0.58	0.64
50	0.25	0.50	0.56	0.63
55	0.24	0.49	0.55	0.62
60	0.61	0.74	0.77	0.79
75	0.60	0.73	0.76	0.78
80	0.60	0.73	0.76	0.78

Residential-Duty Commercial Gas-Fired Storage (> 75,000 Btu/h, ≤ 105,000 Btu/h) - Minimum UEF

Volume (gallons)	0 ≤ FHR < 18	18 ≤ FHR < 51	51 ≤ FHR < 75	FHR ≥ 75
50	0.22	0.48	0.55	0.61
60	0.21	0.46	0.53	0.61
75	0.2	0.45	0.52	0.59
80	0.2	0.44	0.51	0.59

Consumer Electric Instantaneous (≤ 12 kW) - Minimum UEF

Volume (gallons)	Max Rating 0 ≤ GPM < 1.7	Max Rating 1.7 ≤ GPM < 2.8	Max Rating 2.8 ≤ GPM < 4.0	Max Rating GPM ≥ 4.0
≤ 2	0.91	0.91	0.91	0.92

Residential-Duty Commercial Electric Instantaneous (> 12 kW, ≤ 58.6 kW) - Minimum UEF

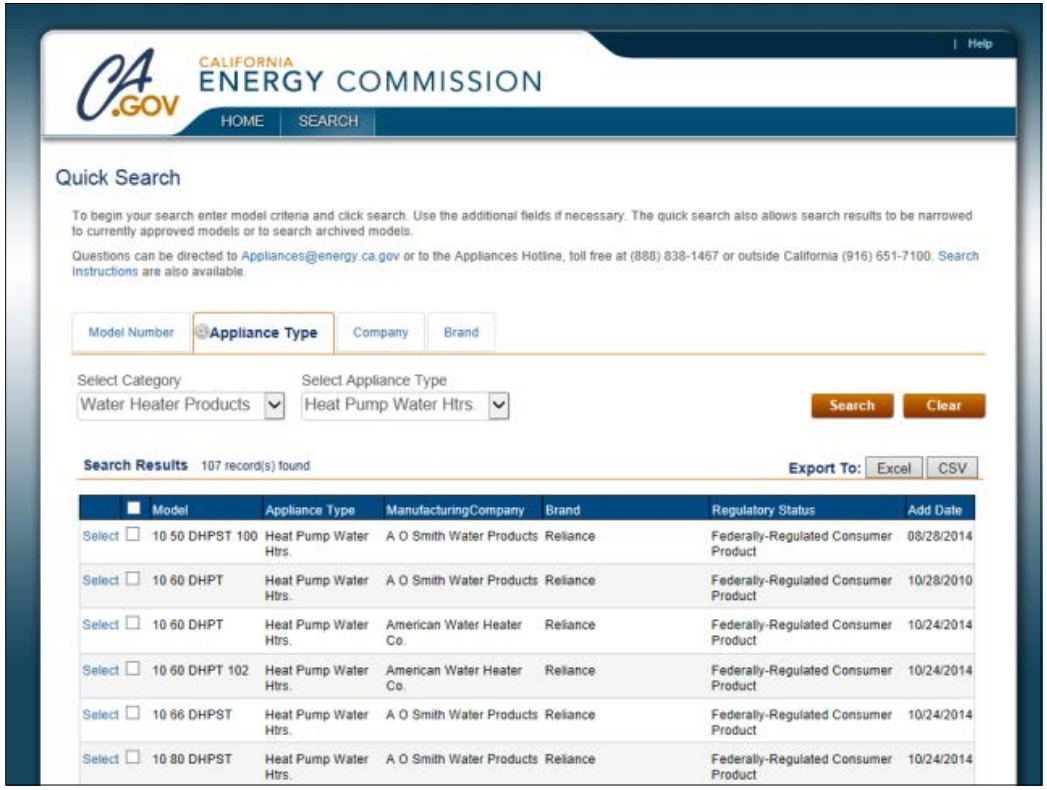
Volume (gallons)	Max Rating 0 ≤ GPM < 1.7	Max Rating 1.7 ≤ GPM < 2.8	Max Rating 2.8 ≤ GPM < 4.0	Max Rating GPM ≥ 4.0
≤ 2	0.80	0.80	0.80	0.80

Btu/h British thermal units per hour | kW Kilowatt | GPM Gallons Per Minute | FHR First Hour Rating | UEF Uniform Energy Factor

§ 110.1 - Mandatory Requirements for Appliances

b) Verify efficiency using:

- Appliance database
- Equivalent federal directory
- Approved trade association directory



https://cacertappliances.energy.ca.gov/Login.aspx

§ 110.3 - Mandatory Requirements for Service Water-Heating Systems and Equipment

a) Certification - Only manufacturer certified systems and equipment can be installed.

§ 110.3 - Mandatory Requirements for Service Water-Heating Systems and Equipment

c) Water Heater Installation

1. Outlet temp controls - On systems that have a total capacity greater than 167,000 Btu/hr, outlets that require higher than service water temperatures as listed in the ASHRAE Handbook, Applications Volume, must have one of the following:
   - Separate remote heaters
   - Heat exchangers
   - Boosters to supply the outlet with the higher temperature

§ 110.3 - Mandatory Requirements for Service Water-Heating Systems and Equipment

c) Water Heater Installation *(continued)*

2. Service hot water systems with circulating pumps or with electrical heat trace systems must be capable of automatically turning off the system when hot water is not required
3. Public lavatories must have controls to limit the outlet temperature to 110˚F

§ 110.3 - Mandatory Requirements for Service Water-Heating Systems and Equipment

c) Water Heater Installation *(continued)*

4. Insulation for unfired hot water storage tanks and back up tanks for solar heating systems must meet one of the following:

   A. R-12 external

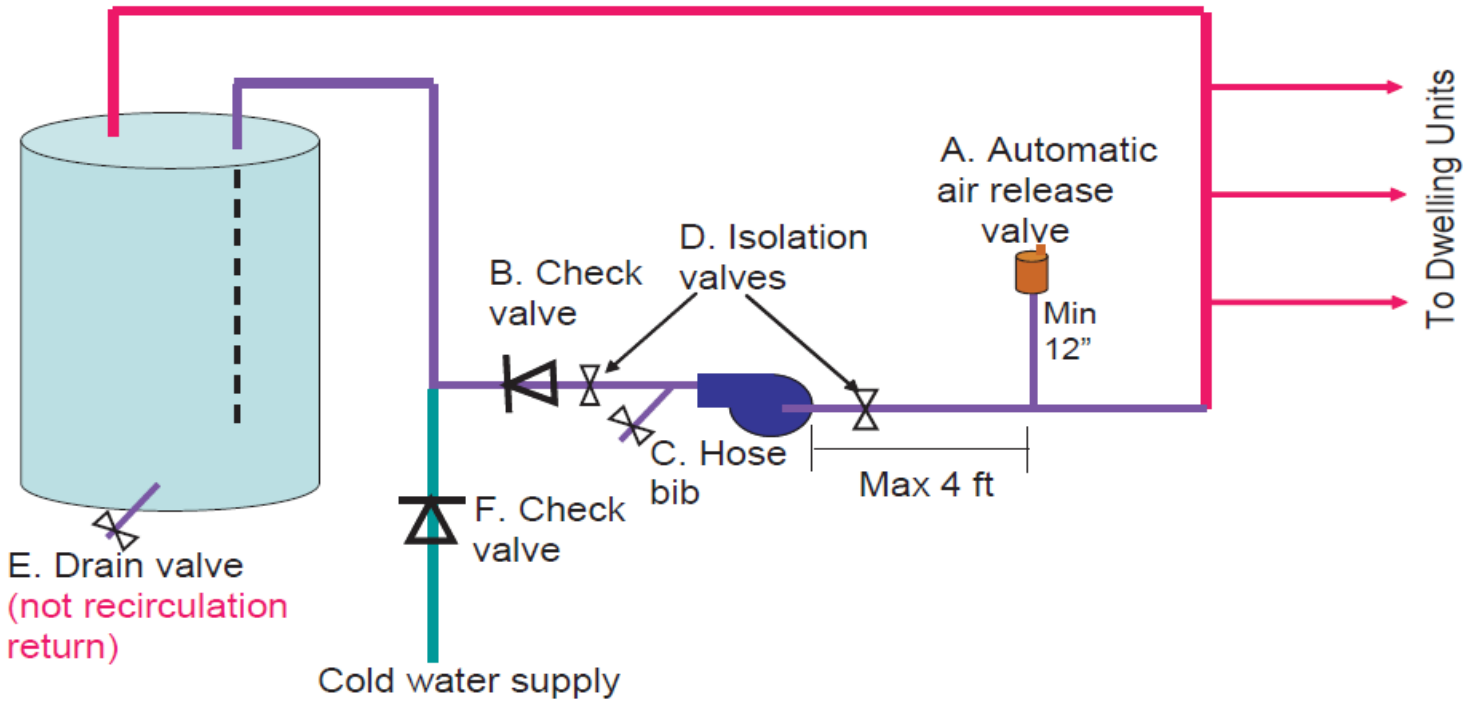
   B. R-16 combined internal and external

   C. Heat loss of less than 6.5 Btu per hour per square foot at tank surface

§ 110.3 - Mandatory Requirements for Service Water-Heating Systems and Equipment

c) Water Heater Installation *(continued)*

5. Recirculation loops

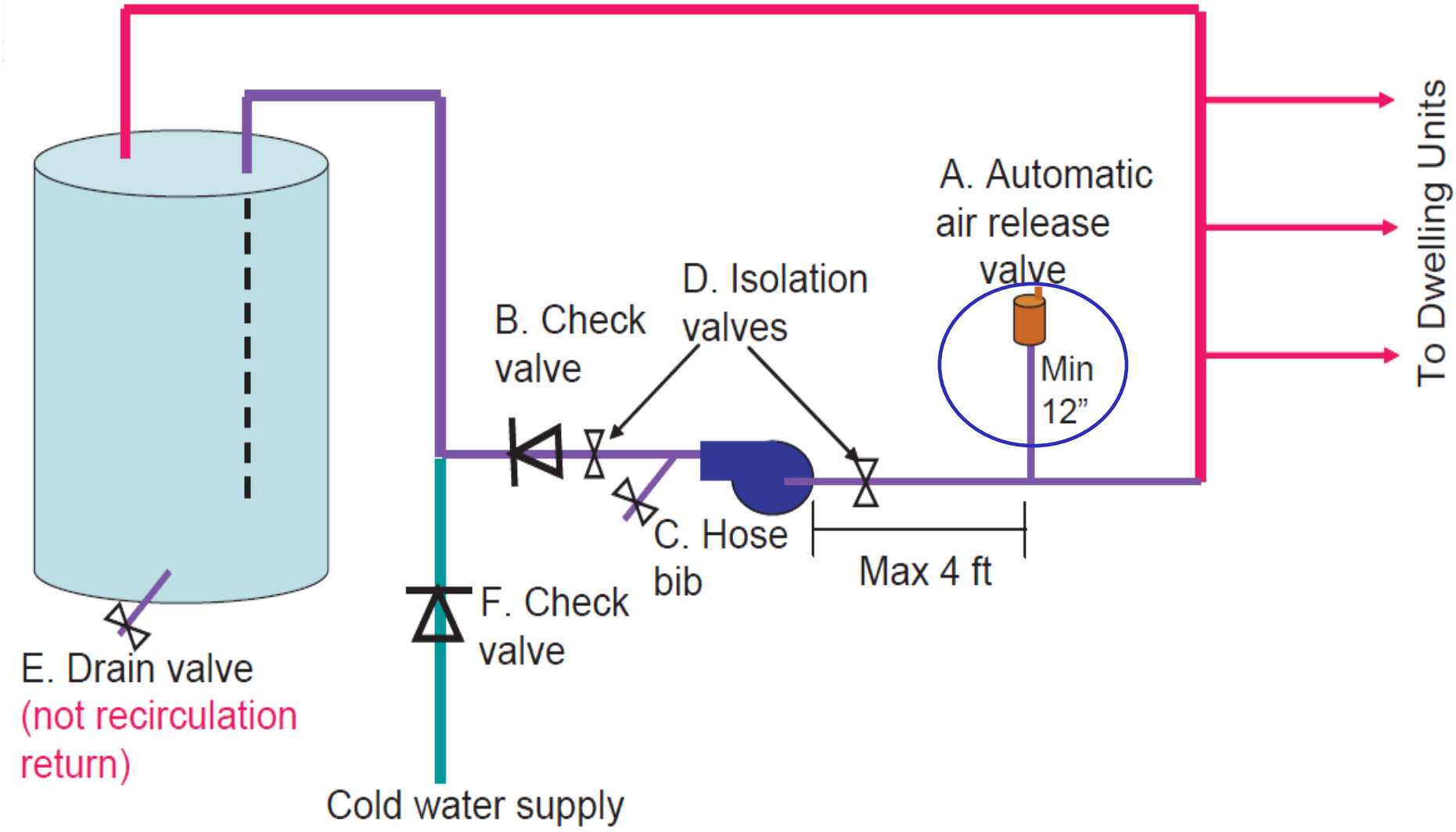


§ 110.3 - Mandatory Requirements for Service Water-Heating Systems and Equipment

c) Water Heater Installation *(continued)*

5. Recirculation loops serving multiple dwelling units, high-rise residential, hotel/motel, and nonresidential occupancies must meet <u>all of the following requirements</u>:

A. Air release valve or vertical pump installation

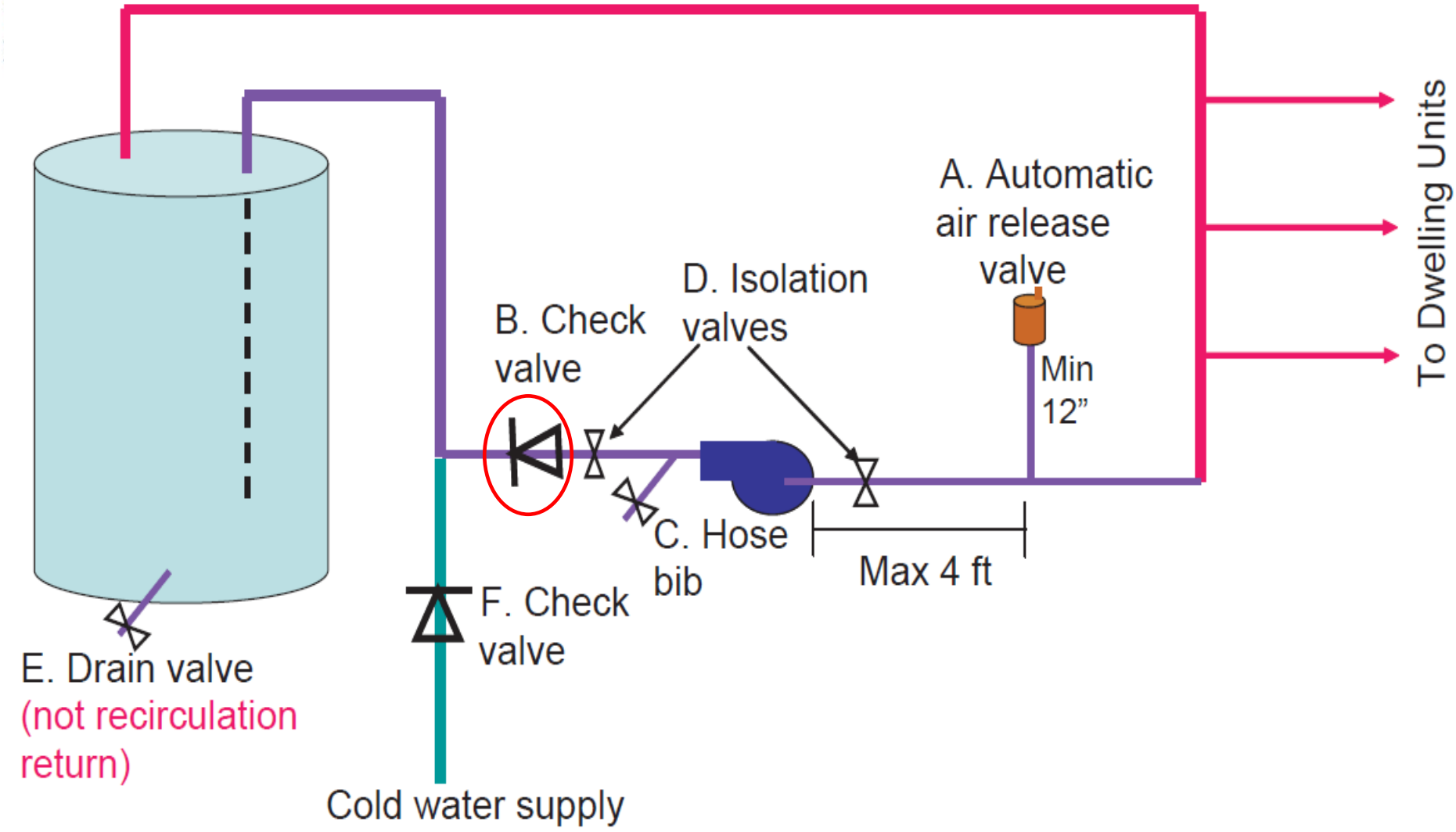

A. Automatic air release valve
D. Isolation valves
B. Check valve
Min 12”
To Dwelling Units
C. Hose bib
Max 4 ft
F. Check valve
E. Drain valve (not recirculation return)
Cold water supply

§ 110.3 - Mandatory Requirements for Service Water-Heating Systems and Equipment

c) Water Heater Installation *(continued)*

5. Recirculation loops serving multiple dwelling units, high-rise residential, hotel/motel, and nonresidential occupancies must meet all of the following requirements:

B. Recirculation loop backflow prevention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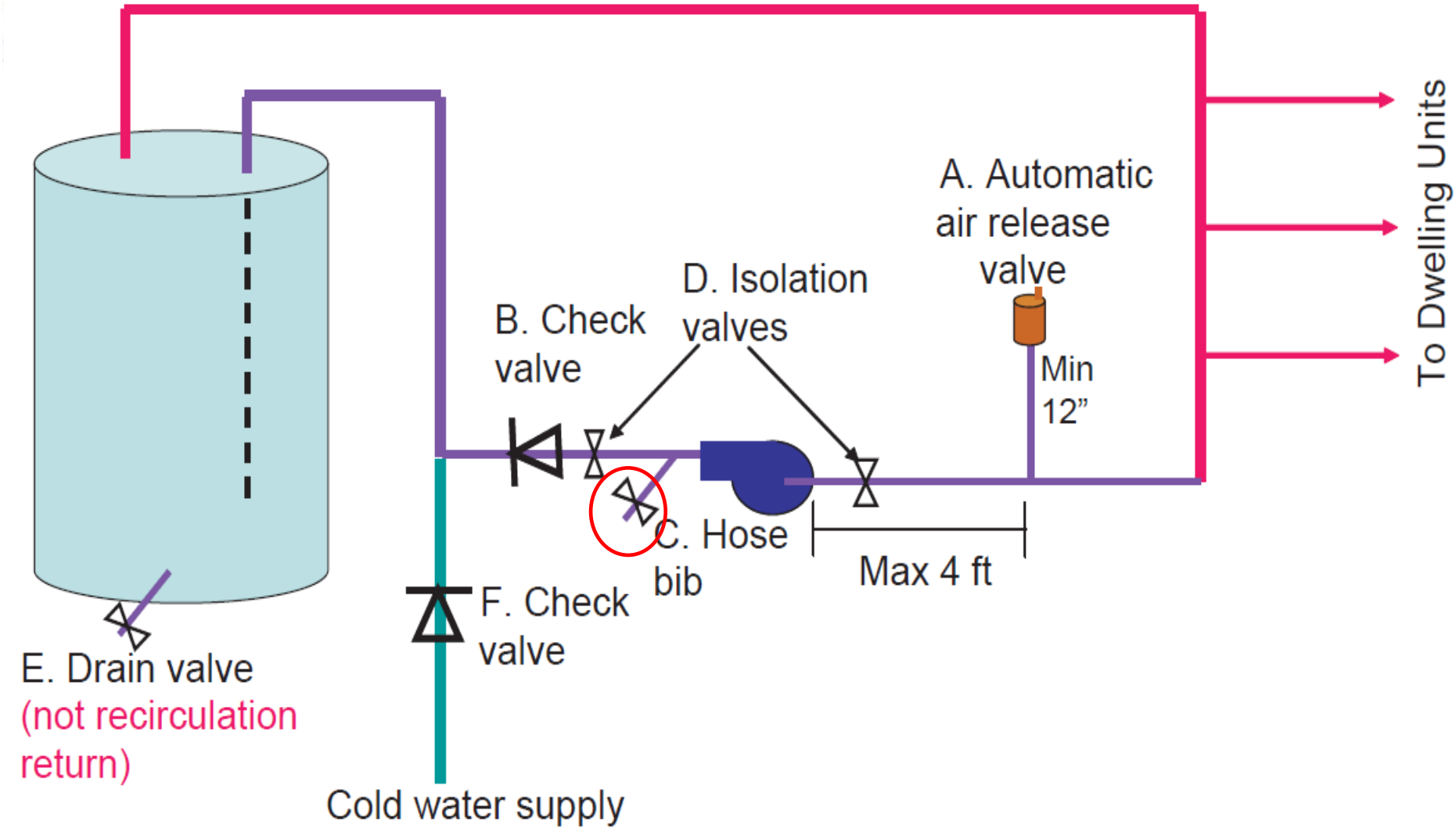
Cold water supply

§ 110.3 - Mandatory Requirements for Service Water-Heating Systems and Equipment

c) Water Heater Installation *(continued)*

5. Recirculation loops serving multiple dwelling units, high-rise residential, hotel/motel, and nonresidential occupancies must meet all of the following requirements:

C. Equipment for pump priming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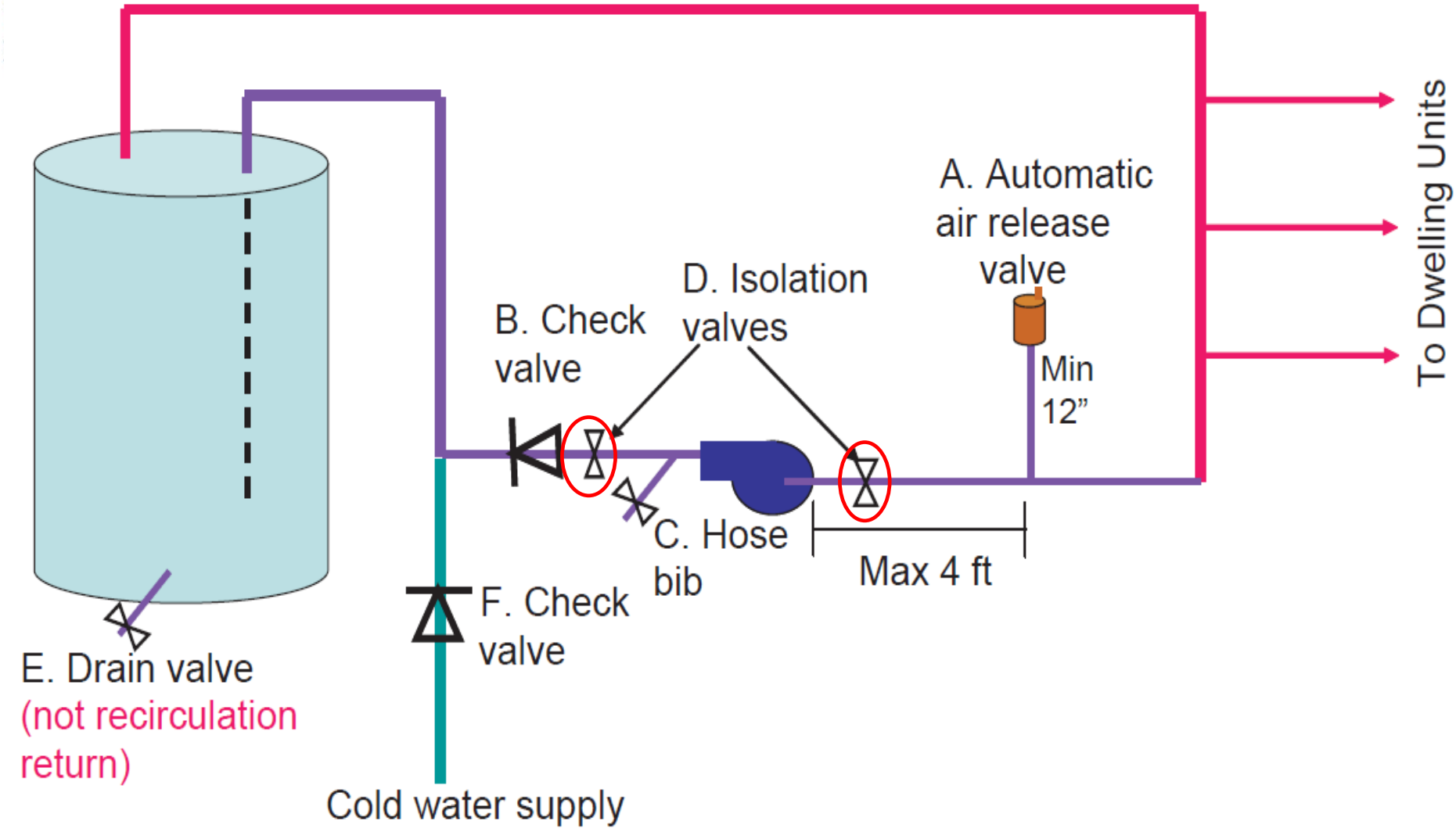
§ 110.3 - Mandatory Requirements for Service Water-Heating Systems and Equipment

c) Water Heater Installation *(continued)*

5. Recirculation loops serving multiple dwelling units, high-rise residential, hotel/motel, and nonresidential occupancies must meet <u>all of the following requirements</u>:

D. Pump isolation valves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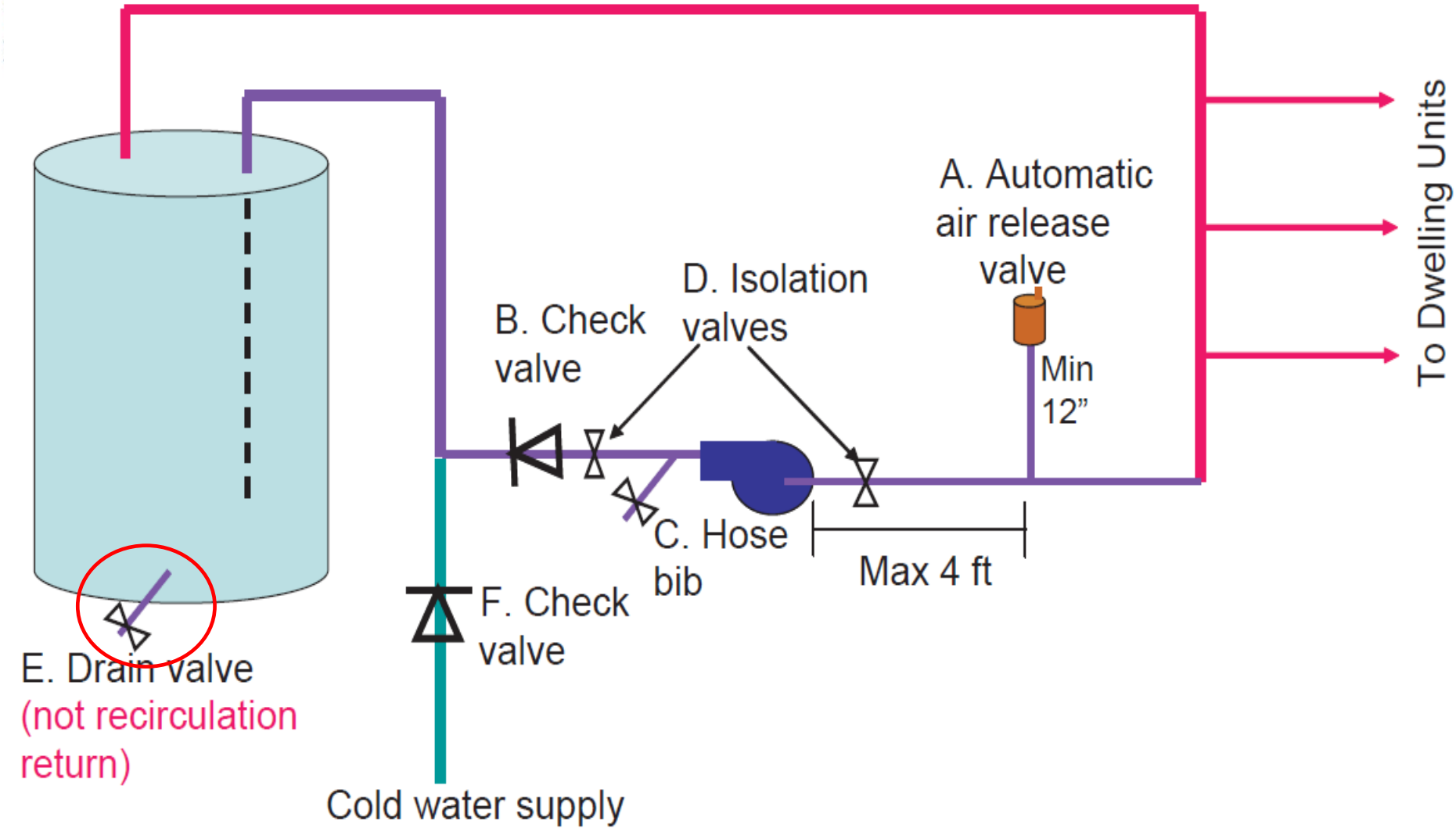
Cold water supply

§ 110.3 - Mandatory Requirements for Service Water-Heating Systems and Equipment

c) Water Heater Installation *(continued)*

5. Recirculation loops serving multiple dwelling units, high-rise residential, hotel/motel, and nonresidential occupancies must meet <u>all of the following requirements</u>:

E. Cold water supply and recirculation loop piping must not be connected to the hot water storage tank drain port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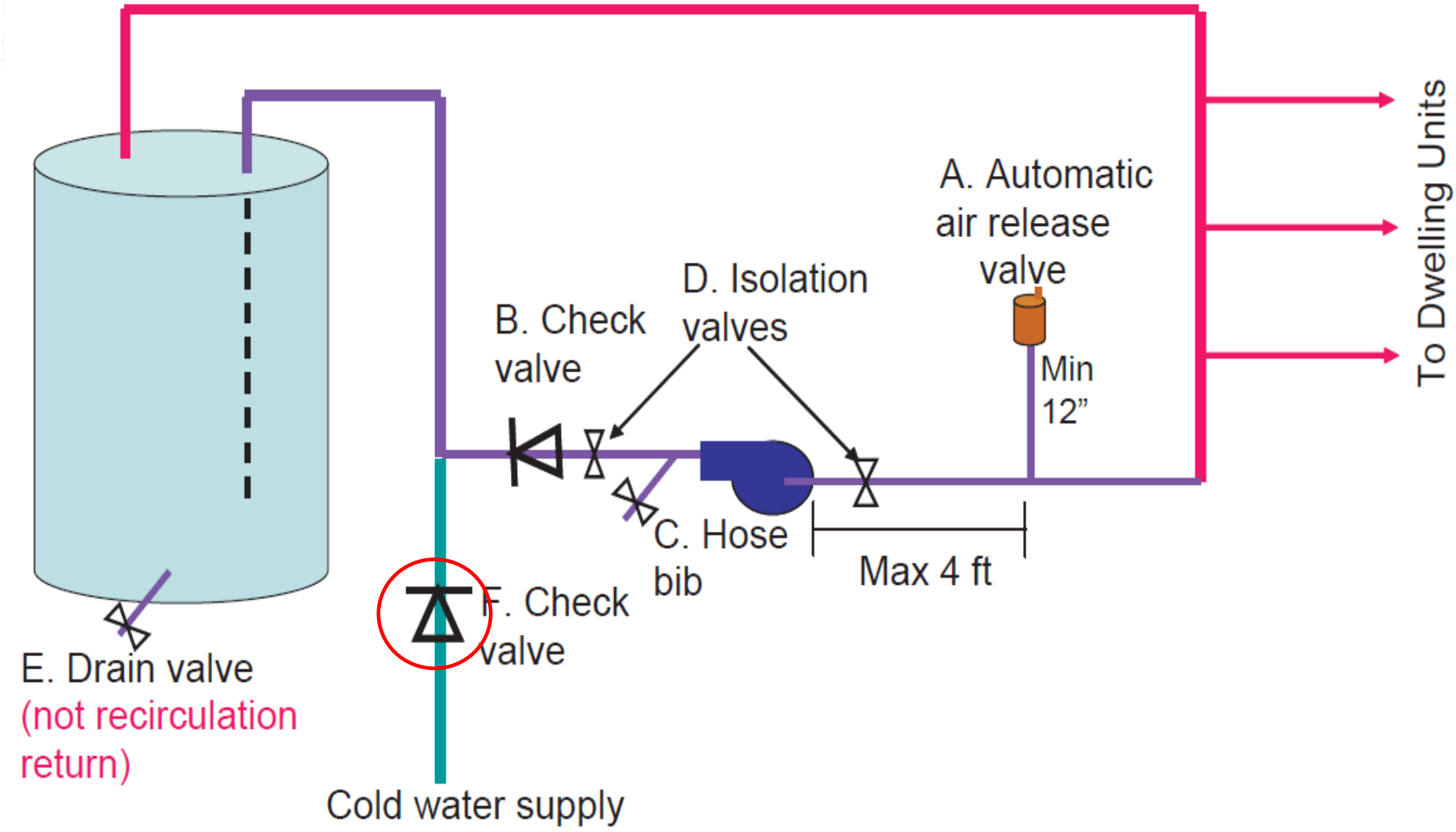
Cold water supply

§ 110.3 - Mandatory Requirements for Service Water-Heating Systems and Equipment

c) Water Heater Installation *(continued)*

5. Recirculation loops serving multiple dwelling units, high-rise residential, hotel/motel, and nonresidential occupancies must meet <u>all of the following requirements</u>:

F. Cold water supply backflow prevention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Max 4 ft
F. Check valve
E. Drain valve (not recirculation return)
Cold water supply

§ 110.3 - Mandatory Requirements for Service Water-Heating Systems and Equipment

c) Water Heater Installation *(continued)*

6. New state built buildings must get at least 60 percent of the energy needed for water heating from site solar or recovered energy

EXCEPTION: Buildings the state architect determines that this requirement is economically or physically infeasible

§ 110.3 - Mandatory Requirements for Service Water-Heating Systems and Equipment

c) Water Heater Installation *(continued)*

7. Isolation valves

- Isolation valves and fittings required for instantaneous water heaters > 6.8 kBtu/hr (2 kW)
- Must be installed on cold line in, and hot water line out
- Allows for maintenance


Rheem
120

Summary of §110.1 and §110.3

- Installed appliances must meet Appliance Efficiency Regulations
- Verify efficiency using the appliance database
- Manufacturers must certify and test appliances as required
- Remote heaters/boosters for higher than service temperature outlets (systems > 167,000 Btu/hr)
- Automatic controls for water-heating systems
- Limit temperature of public lavatories to 110˚F

Summary of §110.1 and §110.3

- Insulate storage and back up tanks as required
- If applicable, make sure recirculation systems have:
  - Air release valve or vertical pump installation
  - Recirculation loop backflow prevention
  - Equipment for pump priming
  - Pump isolation valves
  - No connections to the hot water storage tank drain port
  - Cold water supply backflow prevention
- Solar/recovered energy required for water heating in state built newly constructed buildings
- Isolation valves and fittings for instantaneous water heaters > 6.8 kBTU/hr (2kW)

Enforcement of § 110.1 and § 110.3

Plan Review

Verify efficiencies on CF1R or NRCC-PLB-01

- Can ask for mandatory measures summary
- Can require note block

Inspection

Visually verify equipment efficiencies and controls

- Can ask for database print out, or manufacturer cut sheet
- Confirm on CF2R-PLB (01, 02, 21, or 22) (use the PSR)
- Confirm on CF3R-PLB (21 or 22) (use the PSR)
- Confirm on NRCI-PLB (01 and 02, 03, 21, or 22)
- Confirm on NRCV-PLB (21 or 22)

NONRESIDENTIAL, HIGH-RISE RESIDENTIAL, HOTEL/MOTEL OCCUPANCIES, AND COVERED PROCESSES - MANDATORY REQUIREMENTS

SECTION 120.3

§ 120.3(a) – General Requirements for Pipe Insulation

Insulate the following according to TABLE 120.3-A

3. Service water-heating systems
   - A. Recirculating system piping, including the supply and return piping of the water heater
   - B. The first 8 feet of hot and cold outlet piping for a nonrecirculating storage system
   - C. The inlet pipe between the storage tank and a heat trap in a nonrecirculating storage system
   - D. Pipes that are externally heated

§ 120.3(b) - Insulation Protection

Protect insulation from:

- Sunlight 
- Moisture 
- Equipment maintenance 
- Wind 

§ 120.3(b) - Insulation Protection

1. Insulation exposed to weather:
   - Must be installed with a cover suitable for outdoor service
     - The cover must provide shielding from solar radiation and be water retardant


HOT WATER RETURN
HOT WATER RETURN

§ 120.3 - Requirements for Pipe Insulation

c) Insulation Thickness

1. Insulate pipes according to TABLE 120.3-A

TABLE 120.3-A PIPE INSULATION THICKNESS

FLUID TEMPERATURE RANGE (°F)	CONDUCTIVITY RANGE (in Btu-inch per hour per square foot per °F)	INSULATION MEAN RATING TEMPERATURE (°F)	NOMINAL PIPE DIAMETER (in inches)				
			< 1	1 to <1.5	1.5 to < 4	4 to < 8	8 and larger
			INSULATION THICKNESS REQUIRED (in inches)				
Space heating, Hot Water systems (steam, steam condensate and hot water) and Service Water Heating Systems (recirculating sections, all piping in electric trace tape systems, and the first 8 feet of piping from the storage tank for nonrecirculating systems)							
Above 350	0.32-0.34	250	4.5	5.0	5.0	5.0	5.0
251-350	0.29-0.32	200	3.0	4.0	4.5	4.5	4.5
201-250	0.27-0.30	150	2.5	2.5	2.5	3.0	3.0
141-200	0.25-0.29	125	1.5	1.5	2.0	2.0	2.0
105-140	0.22-0.28	100	1.0	1.5	1.5	1.5	1.5

§ 120.3 - Requirements for Pipe Insulation

c) Insulation Thickness

2. If TABLE 120.3-A doesn't include the needed insulation conductivity range, use the equation:

$$T = PR\left[\left(1+\frac{t}{PR}\right)^{\frac{K}{k}}-1\right]$$

WHERE:

T	=	Minimum insulation thickness for material with conductivity *K*, inches.
PR	=	Pipe actual outside radius, inches.
t	=	Insulation thickness from TABLE 120.3-A, inches.
K	=	Conductivity of alternate material at the mean rating temperature indicated in TABLE 120.3-A for the applicable fluid temperature range, in Btu-inch per hour per square foot per °F.
k	=	The lower value of the conductivity range listed in TABLE 120.3-A for the applicable fluid temperature range, Btu-inch per hour per square foot per °F.

Summary of § 120.3

- Protect outdoor insulation
- Use the correct insulation (e.g. rated for outdoor use)
- Use insulation with the correct thickness (TABLE 120.3-A)
- If you can't use TABLE 120.3-A, use the equation

Enforcement of § 120.3

Plan Review

Verify insulation protection, type and thickness

- Can require note block

Inspection

Visually verify insulation protection, type and thickness

- Can ask for manufacturer cut sheet
- Confirm on NRCI-PLB (01 and 03 or 22)
- Confirm on NRCI-STH-01
- Confirm on NRCV-PLB (21 or 22)

HIGH-RISE RESIDENTIAL, AND HOTEL/MOTEL OCCUPANCIES - PERFORMANCE AND PRESCRIPTIVE COMPLIANCE APPROACHES FOR ACHIEVING ENERGY EFFICIENCY

SECTION 140.5

§ 140.5 - Prescriptive Requirements for Service Water-Heating Systems

b) High-rise residential and hotel/motel occupancies - Must comply with § 150.1(c)8 *(coming up)*

NONRESIDENTIAL, HIGH-RISE RESIDENTIAL, AND HOTEL/MOTEL OCCUPANCIES - ADDITIONS, ALTERATIONS, AND REPAIRS

SECTION 141.0

§141.0 - Additions, Alterations, and Repairs to Existing High-Rise Residential and Hotel/Motel Buildings

a) **Additions** must meet 1 or 2

1. Prescriptive - Meet applicable requirements of §110.1, §110.3, §120.3 and § 140.5. *(previous)*

§ 141.0 - Additions, Alterations, and Repairs to Existing High-Rise Residential and Hotel/Motel Buildings

a) **Additions** must meet 1 or 2 *(continued)*

2. Performance

A. Newly installed water-heating system serving the addition must meet the applicable requirements of § 110.1, § 110.3, and § 120.3

B. Meet one of the following:

i. The addition alone must meet § 140.1

ii. Existing + Addition + Alteration (E+A+A)

§ 141.0 - Additions, Alterations, and Repairs to Existing High-Rise Residential and Hotel/Motel Buildings

a) Additions

EXCEPTION 1: When service water heating to an addition is provided by expanding existing systems, the existing systems and equipment need not comply with § 110.1, § 110.3, § 120.3, or § 140.5.

§ 141.0 - Additions, Alterations, and Repairs to Existing High-Rise Residential and Hotel/Motel Buildings

b) Alterations

2. Prescriptive approach - The altered components must meet applicable requirements of § 110.1, § 110.3, § 120.3

N. Meet § 140.5 - except for the solar water heating requirements

§ 141.0 - Additions, Alterations, and Repairs to Existing Nonresidential, High-Rise Residential, and Hotel/Motel Buildings

b) Alterations

3. Performance approach

A. Must meet applicable requirements of § 110.1, § 110.3, and § 120.3

B. § 140.5 - except for the solar water heating requirements

Summary of § 141.0

- Additions
  - Use prescriptive or performance paths of compliance
  - If expanding a system, existing system and equipment do not need to comply
- Alterations
  - Use prescriptive or performance paths of compliance

LOW-RISE RESIDENTIAL BUILDINGS - MANDATORY FEATURES AND DEVICES

SECTION 150.0

§ 150.0(j)1 - Insulation for Tanks

Unfired hot water storage tanks and backup solar storage tanks must be insulated with one of the following:

- R-12 external
- R-16 internal (must be labeled)

§ 150.0(j)2 - Insulation Thickness and Conductivity

A. Insulate the following water piping according to TABLE 120.3-A:

i. First 5 feet of hot and cold pipes from storage tank

ii. All hot water piping ¾" or larger

iii. All piping for recirculation systems

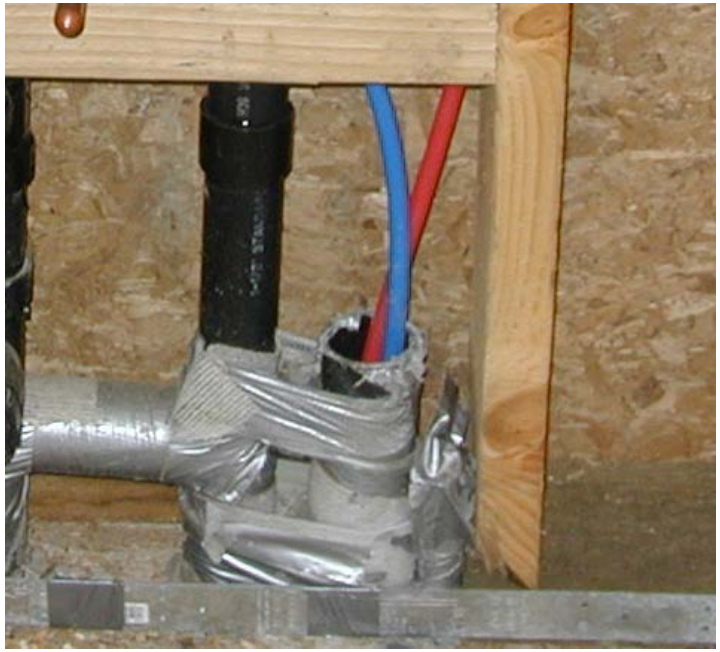
iv. Piping from heating source to storage tank or between tanks

v. Hot water piping buried below grade (e.g. kitchen island)

vi. Piping between the heating source and kitchen fixtures

§ 150.0(j)2 - Insulation Thickness and Conductivity

B. Buried hot water piping must be installed in waterproof, non-crushable casing or sleeve



§ 150.0(j)2 - Insulation Thickness and Conductivity

C. Distribution piping for steam and hydronic heating systems must be insulated according to TABLE 120.3-A

§ 150.0(j)2 - Exceptions

Exception 2: Piping that serves process loads, gas piping, cold domestic water piping, condensate drains, roof drains, vents, or waste piping

§ 150.0(j)2 - Exceptions

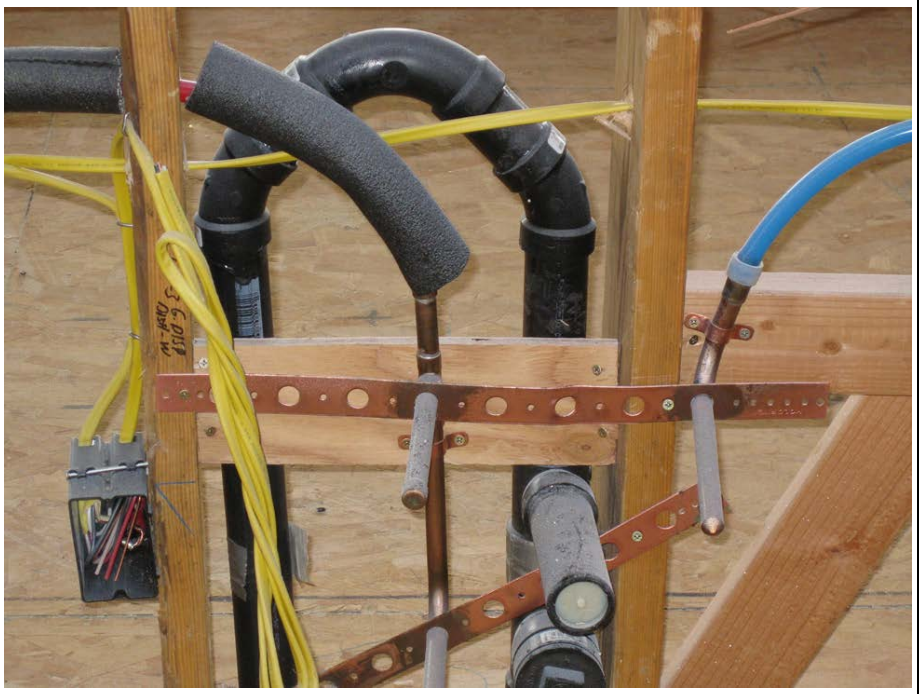
Exception 3:

- Portions of piping that penetrate framing members
- Metal piping penetrating metal framing must use grommets, plugs, wrapping or other insulating material to eliminate metal to metal contact

§ 150.0(j)2 - Exceptions

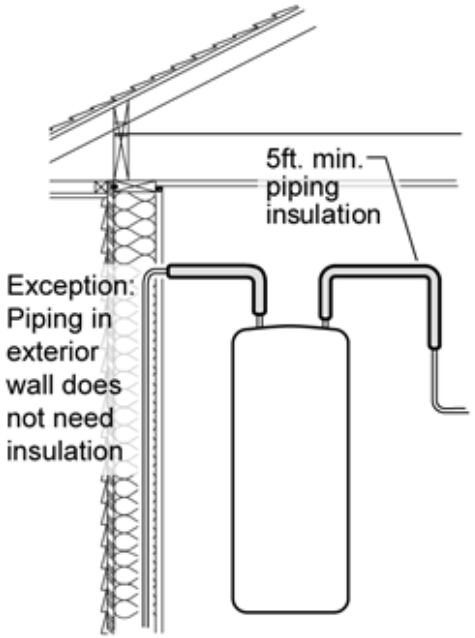
Exception 3 *(continued)*:

- Insulation must abut securely against all framing members



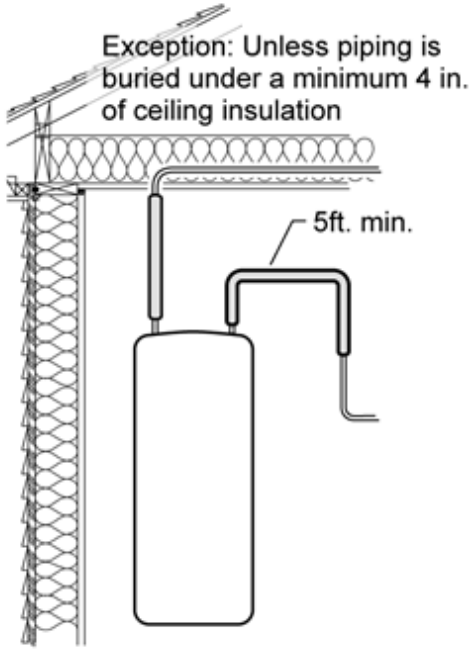
§ 150.0(j)2 - Exceptions

Exception 4: Piping installed in interior or exterior walls which meet QII requirements



§ 150.0(j)2 - Exceptions

Exception 5: Piping installed in attics with a minimum of 4” of attic insulation on top of the piping



§ 150.0(j)3 - Insulation Protection

Insulation outside of conditioned space must be protected from:

- Sunlight 
- Moisture 
- Equipment maintenance 
- Wind 

§150.0(j)3 - Insulation Protection

A. Insulation exposed to weather:
   - Must be installed with a cover suitable for outdoor service
     - The cover must provide shielding from solar radiation and be water retardant


HOT WATER RETURN
HOT WATER RETURN

§ 150.0(n) – Water-Heating System

1. Systems using gas or propane water heaters to serve individual dwelling units must include all of the following components:
   A. A 120V electrical receptacle that is within 3 feet from the water heater and accessible to the water heater with no obstructions
   B. Category III or IV vent, or a Type B vent with straight pipe between the outside termination and the space where the water heater is installed

§ 150.0(n) – Water-Heating System

1. Systems using gas or propane water heaters to serve individual dwelling units must include the following components: *(continued)*
   C. A condensate drain that is no more than 2 inches higher than the base of the installed water heater, and allows natural draining without pump assistance
   D. A gas supply line with a capacity of at least 200,000 Btu/hr

§ 150.0(n) – Water-Heating System

2. Water heating recirculation loops serving multiple dwelling units must meet the requirements of § 110.3(c)5
3. Solar water-heating systems and collectors must be certified and rated by the Solar Rating and Certification Corporation (SRCC), IAPMO-RT, or by a testing agency approved by the Executive Director
4. If installing an instantaneous water heater with an input rating greater than 6.8 kBTU (2kW), it must have isolation valves as required by § 110.3(c)7

Summary of § 150.0

- Insulate unfired hot water storage tanks as required
- Insulate hot water pipes according to TABLE 120.3-A
- Insulate:
  - First 5 feet of hot and cold pipes from storage tank
  - All hot water piping ¾" or larger
  - All piping for recirculation systems
  - Piping from heating source to storage tank or between tanks
  - Buried hot water piping
  - Piping between the heating source and kitchen fixtures
- Insulate and protect buried hot water pipes

Summary of § 150.0

- Insulate distribution piping for steam and hydronic heating systems according to TABLE 120.3-A
- Protect insulation
- Use the correct insulation
- If installing gas or propane water heaters, install:
  - A 120V electrical receptacle
  - Category III or IV vent, or a Type B vent with straight pipe
  - A condensate drain
  - A gas supply line with a capacity of at least 200,000 Btu/hr

Enforcement of § 150.0

Plan Review

Verify equipment on CF1R

- Can ask for mandatory measures summary
- Can require note block

Inspection

Visually verify equipment and insulation protection, type, and thickness

- Can ask for manufacturer cut sheet
- Confirm on CF2R-PLB (01 and 02, 21 or 22), (use the PSR)
- Confirm on CF2R-STH-01, (use the PSR)
- Confirm on CF3R-PLB (21 or 22)

LOW-RISE RESIDENTIAL BUILDINGS - PERFORMANCE AND PRESCRIPTIVE COMPLIANCE APPROACHES FOR NEWLY CONSTRUCTED RESIDENTIAL BUILDINGS

SECTION 150.1

§ 150.1(a) - Performance and Prescriptive Compliance Approaches for Newly Constructed Residential Buildings

Basic Requirements - Newly constructed low-rise residential buildings must meet:

1. § 110.1 and § 110.3
2. § 150.0
3. Performance or prescriptive standards

§ 150.1(b) - Performance Compliance for Newly Constructed Residential Buildings

Compliance with Energy Budget (EB)

- Energy Budget Rule
- Trade offs allowed

$$EB_{\underline{Proposed}\ Design\ Building} \leq EB_{\underline{Standard}\ Design\ Building}$$

§ 150.1(b)2 § 150.1(b)1

§ 150.1(c) - Prescriptive Compliance Newly Constructed Residential Buildings

8. Domestic water-heating systems – Can install manually controlled demand circulation systems.

   Must meet one of the following (A or B):

   A. Systems serving individual dwelling units (3 options):

      i. A single gas or propane instantaneous water heater with an input of 200,000 Btu/hr or less

§ 150.1(c) - Prescriptive Compliance for Newly Constructed Residential Buildings

8. Domestic water-heating systems - Must meet A or B *(continued)*:

   A. Systems serving individual dwelling units:

      ii.

All of the Below	Plus One of the Below (Must be HERS Verified)
• 1 gas or propane storage water heater • ≤ 55 gallons • ≤ 105,000 Btu/hr • Quality Insulation Installation (QII)	• Compact distribution • All hot water pipes insulated

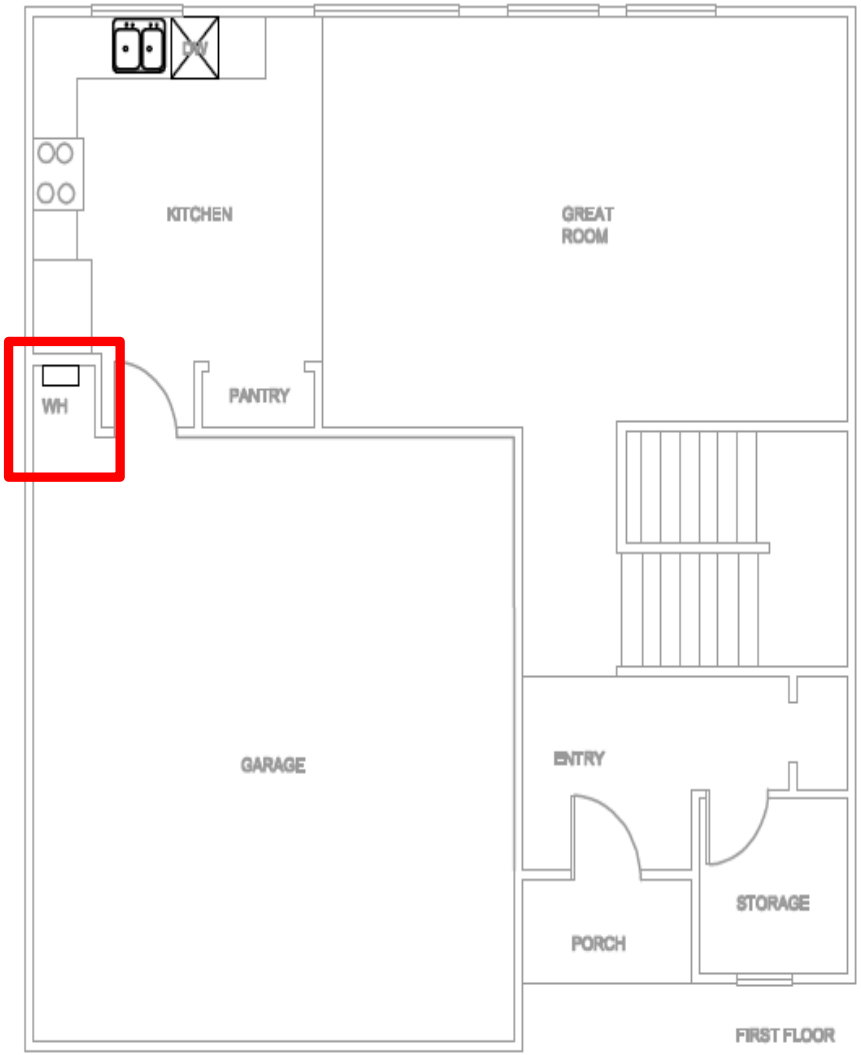
§ 150.1(c) - Prescriptive Compliance for Newly Constructed Residential Buildings

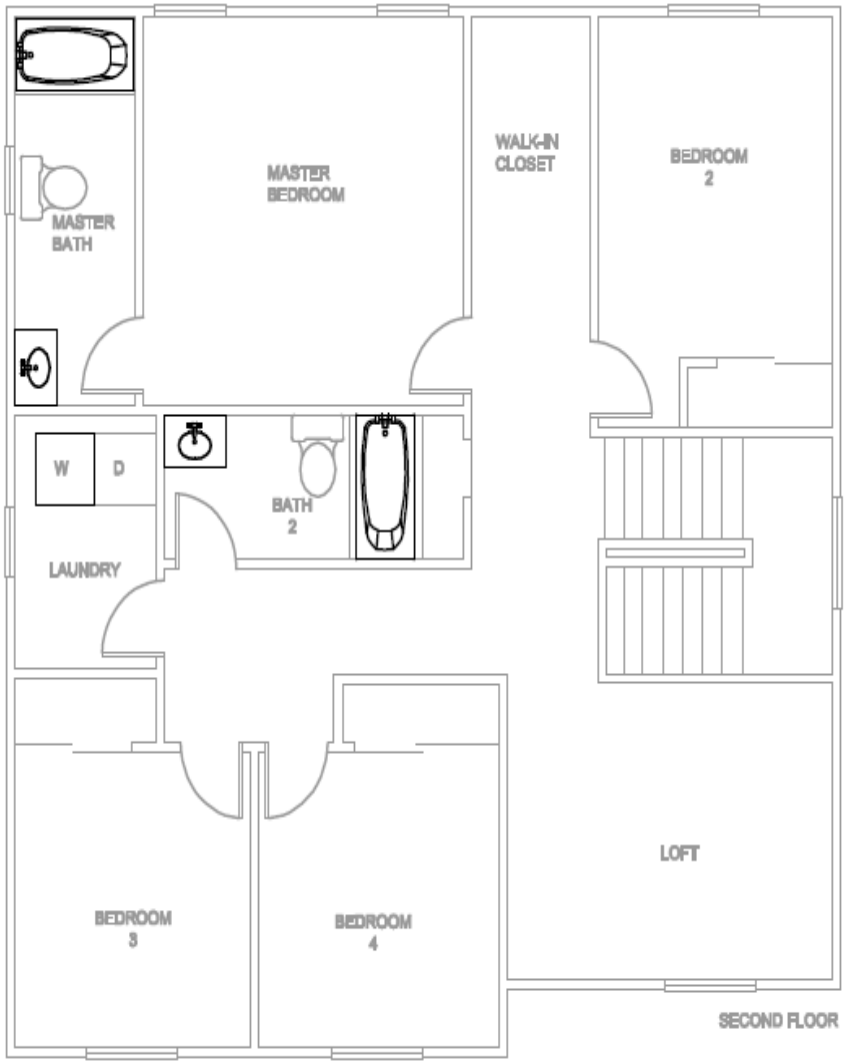
8. Domestic water-heating systems - Must meet A or B *(continued)*:

   A. Systems serving individual dwelling units:

      iii.

All of the Below	Plus One of the Below (Must be HERS Verified)
• 1 gas or propane storage water heater • > 55 gallons • ≤ 105,000 Btu/hr	• Compact distribution • All hot water pipes insulated


KITCHEN
GREAT ROOM
WH
PANTRY
GARAGE
ENTRY
STORAGE
PORCH
FIRST FLOOR


MASTER BATH
MASTER BEDROOM
WALK-IN CLOSET
BEDROOM 2
W
D
LAUNDRY
BATH 2
BEDROOM 3
BEDROOM 4
LOFT
SECOND FLOOR

§ 150.1(c) - Prescriptive Compliance for Newly Constructed Residential Buildings

8. Domestic water-heating systems - Must meet A or B *(continued):*

   B. For systems serving multiple dwelling units, a central system that includes all of the following:

      i. Gas or propane water heaters, boilers or other water-heating equipment that meet the minimum efficiency requirements of § 110.1 and § 110.3

§ 150.1(c) - Prescriptive Compliance for Newly Constructed Residential Buildings

8. Domestic water-heating systems - Must meet A or B *(continued)*:
   B. Systems serving multiple dwelling units, a central water-heating system that includes the following components must be installed *(continued):*
      ii. A water heating recirculation loop that:
         - Meets the requirements of § 110.3(c)2 and § 110.3(c)5
         - Is equipped with automatic controls
         - Has two recirculation loops, each serving half of the building

§ 150.1(c) - Prescriptive Compliance for Newly Constructed Residential Buildings

8. Domestic water-heating systems - Must meet A or B *(continued)*:
   B. Systems serving multiple dwelling units, a central water-heating system that includes the following components must be installed: *(continued)*
      iii. A solar water-heating system that:
      - Meets the installation criteria in RA4
      - Has a minimum solar savings fraction of 0.20 in CZ 1 - 9, or 0.35 in CZ 10 - 16
      - Meets the solar savings fraction requirements using a Commission approved method

What do we see?

What is done well?

Concerns?

Summary of § 150.1

- Use performance or prescriptive paths of compliance
  - Prescriptive

    Individual dwelling units

    o Install a natural gas or propane water heater

      - If installing a recirculation system, it must be a demand recirculation system with manual control pumps

Summary of § 150.1

- Prescriptive (continued)
  - Multiple dwelling units
    - o Natural gas or propane water-heating equipment
    - o Recirculation loop
    - o Solar water-heating system

Enforcement of § 150.1

Plan Review

Verify water heater type, size, input, and HERS testing on CF1R

- Can require note block

Inspection

Visually verify water heater type, size, input and confirm HERS testing

- Can ask for database print out, or manufacturer cut sheet
- Confirm on CF2R-PLB (01, 02, 21, or 22), (use the PSR)
- Confirm on CF2R-STH-01, (use the PSR)
- Confirm on CF3R-PLB (21 or 22)

LOW-RISE RESIDENTIAL BUILDINGS - ADDITIONS AND ALTERATIONS IN EXISTING LOW-RISE RESIDENTIAL BUILDINGS

SECTION 150.2

§ 150.2(a) - Additions

Additions to existing residential buildings must meet the requirements of § 110.0 - § 110.9 and § 150.0(a) - (q), and either prescriptive or performance requirements.

- EXCEPTION 3: Existing inaccessible piping does not require insulation as defined under § 150.0(j)2Aiii

§ 150.2(a) - Additions

1. Prescriptive Approach
   D. When a second water heater is installed as part of the addition, install one of the following types of water heaters:

      i. Natural gas or propane water-heating system (§ 150.1(c)8)

      ii. Electric water heater (if no natural gas is connected to the building). If installing a recirculation pump, on demand with manual control

§ 150.2(a) - Additions

1. Prescriptive Approach

   D. When a second water heater is installed as part of the addition, install one of the following types of water heaters: *(continued)*

      iii. A water-heating system determined by the executive director to use no more energy than *i* , or *ii* if no natural gas is connected to the building

      iv. Use the compliance software (§ 150.2(b)2) to show that the proposed water-heating system uses no more energy than the system defined in *i*

§150.2(a) - Additions

2. Performance Approach - Performance calculations must meet the requirements of §150.1(a) through (c), pursuant to the applicable requirements in Items A, and B:

   A. For additions alone - The addition complies if the addition alone meets the energy budgets as specified in §150.1(b)

§150.2(a) - Additions

2. Performance Approach - Performance calculations must meet the requirements of § 150.1(a) through (c), pursuant to the applicable requirements in Items A, and B *(continued)*

   B. E+A+A. The proposed design energy use is the combination of the existing building's unaltered components to remain and the altered components' energy features, plus the proposed energy features of the addition

§ 150.2(b) - Alterations

Alterations - to existing residential buildings or alterations in conjunction with a change in building occupancy type to a low-rise residential occupancy must meet either prescriptive or performance requirements

1. Prescriptive Approach – The altered component and any newly installed equipment serving the alteration must meet the applicable requirements of § 110.0 - § 110.9 and all applicable requirements of § 150.0(a) - (m), § 150.0(o) - (q) and

§150.2(b) - Alterations

1. Prescriptive Approach
   G. Water-Heating System
      i. Insulate new and existing accessible pipes according to § 150.0(j)2
      ii. Water-heating system that meets one of the following (a-d)
         a. A natural gas or propane water-heating system that:
            - Meets the requirements of §110.1 and §110.3
            - If installing a recirculation pump, on demand with manual control

§150.2(b) - Alterations

1. Prescriptive Approach
   G. Water-Heating System
      ii. Water-heating system that meets one of the following (a-d) *(continued)*
         b. If no natural gas is connected to the building, an electric water heater that:
            - Meets the requirements of §110.1 and §110.3
            - Does not exceed 60 gallons
            - If installing a recirculation pump, on demand with manual control

§ 150.2(b) - Alterations

1. Prescriptive Approach
   G. Water-Heating System
      ii. Water-heating system that meets one of the following (a-d) *(continued)*
         c. A water-heating system determined by the Executive Director to use no more energy than *a* or *b* if no natural gas is connected to the building

§ 150.2 - Alterations

1. Prescriptive Approach
   G. Water-Heating System
      ii. Water-heating system that meets one of the following (a-d) *(continued)*
         d. Use the compliance software (§ 150.2(b)2) to show that the proposed water-heating system uses no more energy than the system defined in *a*

Heat pump water heaters that meet the UEFs listed in the Water Heater Replacements table may be used to replace existing water heaters. This applies only to prescriptive alterations to single dwelling units. The UEF depends on the climate zone where the water heater will be installed. The water heater being replaced can be of any fuel type – natural gas, propane, or electric.

Northwest Energy Efficiency Alliance (NEEA) Tier 3 or higher heat pump water heaters may be installed as described above in climate zones 1-15. If these water heaters are installed in climate zone 16, the solar water heating requirements described in the table must be met.

Per **Section 150.2(b)1Giid**, the California Energy Commission used the performance compliance approach to determine the minimum UEF needed to be able to prescriptively replace an existing water heater with a heat pump water heater. These heat pump water heaters have been precalculated to comply with the prescriptive water heating alteration requirements when serving a single dwelling unit, with or without natural gas connection. These are only a few of many possible combinations that will comply using the performance compliance approach.

Water Heater Replacements (New Heat Pump Water Heater)

Climate Zone	Minimum UEF
1	2.82
2	2.82
3	2.82
4	2.87
5	2.82
6	2.47
7	2.61
8	2.47
9	2.47
10	2.47
11	2.61
12	2.87
13	2.61
14	2.61
15	2.47
16	≥ 3, plus a solar water heating system with solar saving fraction ≥ 0.4

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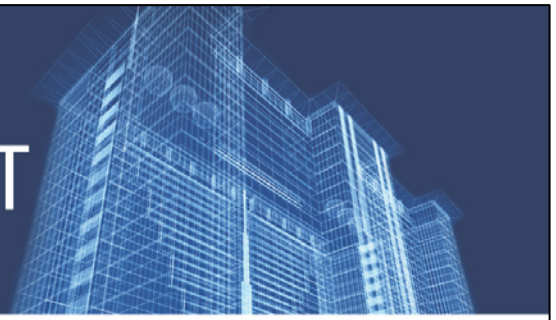
BLUEPRINT

California Energy Commission
Efficiency Division



In This Issue

New Mechanical Acceptance Test Technician Certification Provider

On January 13, 2016, the California Energy Commission (Energy Commission) approved the National Environmental Balancing Bureau (NEBB), as a mechanical Acceptance Test Technician Certification Provider (ATTCP). This gives NEBB the authority to train, certify, and oversee acceptance test technicians (ATTs) and their employers. NEBB will train and certify ATTs to perform all 17 mechanical acceptance tests required in the *2013 Building Energy Efficiency Standards* (Energy Standards).

The Conditions of Approval are available for review in the **Executive Director's recommendation**.

For more information, please visit: **http://energy.ca.gov/title24/attcp/**.

Small Duct High Velocity Space Conditioning Systems

Small duct high velocity (SDHV) systems may be used to comply with the Energy Standards. The following is a list of requirements with direction on how SDHV systems can comply with the low-rise residential requirements of the Energy Standards.

Mandatory Requirements

United States Department of Energy Standards:

SDHV systems manufactured on or after January 23, 2006, and before January 1, 2015, must have a minimum Seasonal Energy Efficiency Ratio (SEER) of 11, and a minimum Heating Seasonal Performance Factor (HSPF) of 6.8.

SDHV systems manufactured on or after January 1, 2015, must have a minimum SEER of 12, and a minimum HSPF of 7.2.

Energy Standards:

Section 150.0(m)13B - Single zone systems that use forced air ducts to supply cooled air to an occupiable space must either meet minimum airflow and fan efficacy requirements, or meet the return duct and grille sizing requirements of **TABLES 150.0-C or 150.0-D**.

NOTE: The return duct and grille sizing alternative will likely be the method chosen for compliance when installing a SDHV system.

Section 150.0(m)15 - Specific to systems with multiple thermostatically controlled zones, this section requires the same mandatory airflow and fan efficacy requirements as **Section 150.0(m)13B**. However, it does not have the same duct and grille sizing alternative. If such systems cannot satisfy the airflow and fan efficacy requirements of this section, compliance must be demonstrated via the performance approach.

The duct leakage and insulation requirements apply as with any other system.

Prescriptive Requirements

The refrigerant charge and duct insulation requirements apply as with any other system.

§ 150.2 - SUMMARY

Additions

- Prescriptive
  - Install a natural gas or propane water-heating system (§ 150.1(c)8)
  - If natural gas is not connected, install an electric water heater
    - If installing recirculation pump, on demand with manual control
  - Executive decision
  - Compliance software

§ 150.2 - SUMMARY

Additions *(continued)*

- Performance
  - Addition alone
  - E+A+A

§ 150.2 - SUMMARY

Alterations

- Prescriptive
  - Install a natural gas or propane water-heating system (§ 150.1(c)8)
  - If natural gas is not connected:
    - Install an electric water heater
    - ≤ 60 gallons
  - If installing a recirculation pump, on demand with manual control
  - Executive decision
  - Compliance software

Enforcement of § 150.2

Plan Review (forms may not be necessary)

Verify compliance on CF1R-ADD or CF1R-ALT

- Can ask for mandatory measures to be shown on the forms

Inspection

Visually verify water heater type, size, input, and pipe insulation

- Can ask for database print out, or manufacturer cut sheet
- Confirm on CF2R-ADD-05 or CF2R-ALT-02
- Confirm on CF2R-STH-01

Questions